Isokinetic shoulder extension strength of trained female uni-lateral arm amputee swimmers

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INTRODUCTION

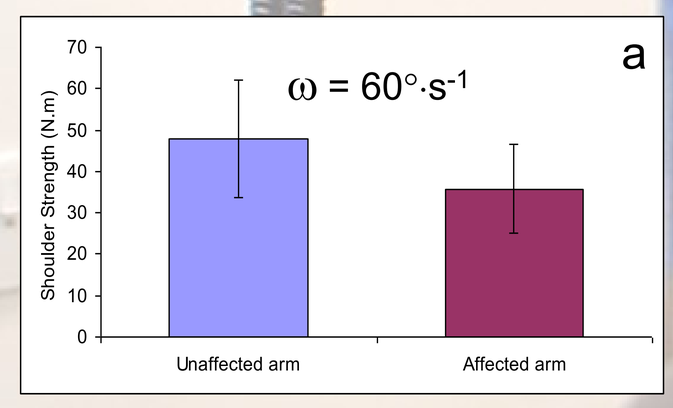
Land-based strength and conditioning work is an important component of a swimmer's training, with development of the shoulder complex usually being an important consideration. Swimmers with an amputation at elbow level, who perform strength training exercises, do so with both their affected and unaffected arms. What has not been well established is the extent of the difference in strength between their two shoulders, and how this varies between arm amputee swimmers.

The purpose of this study was to establish the within and between-swimmer differences in shoulder extension strength of unilateral forearm amputee swimmers.

METHODS

- Participants were nine well-trained female swimmers (16.1 ± 3.2 years; 1.64 ± 0.04 m; 57.7 ± 6.5 kg). All had a single congenital arm amputation at the level of the elbow.
- Best times for the 50 m front crawl ranged between 30.4-39.6 s.
- Shoulder extension strength was measured on a BIODEX System 3 Pro isokinetic dynamometer.
- Five maximal effort shoulder flexion-extension repetitions were performed with the affected and then unaffected arms at a slow speed (60°·s^{-1}) and a fast speed (180°·s^{-1}).
- Mean extension torque generated over the mid-range of the movement (80-100° extension) was found for each repetition, in each condition.
- S*houlder strength* (N·m) - the highest value recorded for this mean extension torque.
- Two-way repeated-measures ANOVA was used to evaluate differences between the conditions.

RESULTS



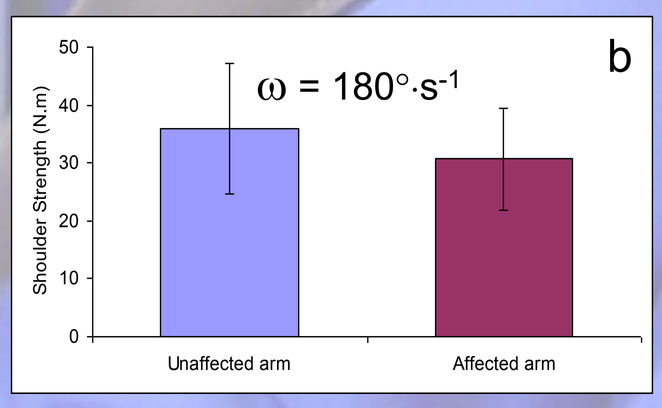


Figure 1. Shoulder strength (mean ± SD) at velocity of a) 60°·s^{-1} and b) 180°·s^{-1}.

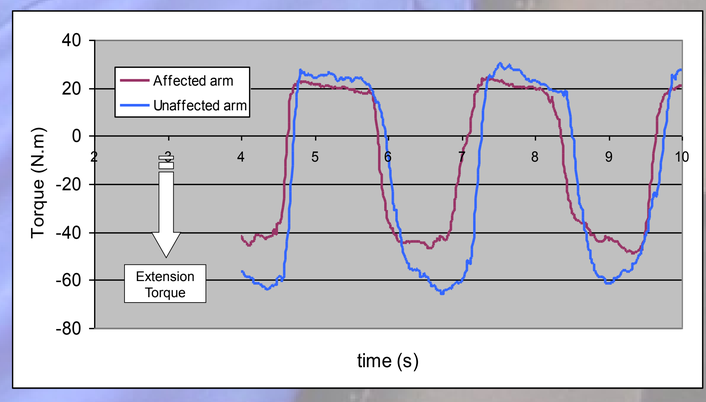


Figure 2. Typical extension torque curve.

- The shoulder of the unaffected side was significantly stronger (p<0.05) than the shoulder on the affected side, at both the slow and fast test speeds, although the degree of strength asymmetry varied considerably between the swimmers.
- The swimmers exhibited significantly greater (p<0.05) shoulder strength at the slow test speed, compared to the fast test speed, on both arms. This finding can be explained by the muscle force-velocity relationship.
- Swimmers who ranked highly when strength was expressed in absolute terms were not necessarily as highly ranked when their strength scores were normalised for body mass (Jaric, 2002).
- No significant relationship was found between the shoulder strength (relative or absolute) or strength asymmetry of the swimmers, and their performance level.

CONCLUSION

Unilateral forearm amputee swimmers generally have greater shoulder extension strength on their unaffected side, compared to their affected side, although there is considerable variation in strength asymmetry between swimmers.

REFERENCE

Jaric, S. (2002). Muscle strength testing: use of normalisation for body size. *Sports Medicine*, *32 (10)*, 615-631.

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